

**Translation**

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

|   |   |   |
|---|---|---|
| Applicant's or agent's file reference<br><b>105138/SM/SSD/IC</b>  | FOR FURTHER ACTION  | See Form PCT/IPEA/416                               |
| International application No.<br><b>PCT/FR2004/001748</b>   | International filing date (day/month/year)<br><b>05.07.2004</b> | Priority date (day/month/year)<br><b>31.07.2003</b> |
| International Patent Classification (IPC) or national classification and IPC<br><b>H03F1/02, H03F3/60, H03F3/72, H01P5/00</b> |   |   |
| Applicant<br><b>ALCATEL</b>   |   |   |

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 18 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a. ☒ (sent to the applicant and to the International Bureau) a total of 5 sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

|                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input checked="" type="checkbox"/> | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application   |

|   |                                   |
|---|-----------------------------------|
| Date of submission of the demand        | Date of completion of this report |
| Name and mailing address of the IPEA/EP | Authorized officer                |
| Facsimile No.                           | Telephone No.                     |

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FR2004/001748

| Box No. I | Basis of the report   |
|-----------|---|
| 1.        | <p>With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.</p> <p><input type="checkbox"/> This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:</p> <p><input type="checkbox"/> international search (Rule 12.3 and 23.1(b))</p> <p><input type="checkbox"/> publication of the international application (Rule 12.4)</p> <p><input type="checkbox"/> international preliminary examination (Rule 55.2 and/or 55.3)</p> <p>2. With regard to the elements of the international application, this report is based on <i>(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)</i>:</p> <p><input type="checkbox"/> the international application as originally filed/furnished</p> <p><input checked="" type="checkbox"/> the description:</p> <p>pages <u>1-16</u> _____ as originally filed/furnished</p> <p>pages* _____ received by this Authority on _____</p> <p>pages* _____ received by this Authority on _____</p> <p><input checked="" type="checkbox"/> the claims:</p> <p>nos. _____ as originally filed/furnished</p> <p>nos.* _____ as amended (together with any statement) under Article 19</p> <p>nos.* <u>1-12</u> _____ received by this Authority on <u>10.12.2004 with letter</u></p> <p>nos.* _____ received by this Authority on <u>of 03.12.2004</u></p> <p><input checked="" type="checkbox"/> the drawings:</p> <p>sheets <u>1/5-5/5</u> _____ as originally filed/furnished</p> <p>sheets* _____ received by this Authority on _____</p> <p>sheets* _____ received by this Authority on _____</p> <p><input type="checkbox"/> a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.</p> <p>3. <input type="checkbox"/> The amendments have resulted in the cancellation of:</p> <p><input type="checkbox"/> the description, pages _____</p> <p><input type="checkbox"/> the claims, nos. _____</p> <p><input type="checkbox"/> the drawings, sheets/figs _____</p> <p><input type="checkbox"/> the sequence listing (<i>specify</i>): _____</p> <p><input type="checkbox"/> any table(s) related to sequence listing (<i>specify</i>): _____</p> <p>4. <input type="checkbox"/> This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).</p> <p><input type="checkbox"/> the description, pages _____</p> <p><input type="checkbox"/> the claims, nos. _____</p> <p><input type="checkbox"/> the drawings, sheets/figs _____</p> <p><input type="checkbox"/> the sequence listing (<i>specify</i>): _____</p> <p><input type="checkbox"/> any table(s) related to sequence listing (<i>specify</i>): _____</p> <p>* If item 4 applies, some or all of those sheets may be marked "superseded."</p> |

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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## Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 7, 11, 12

because:

☐ the said international application, or the said claims Nos. \_\_\_\_\_  
relate to the following subject matter which does not require an international preliminary examination (*specify*):

☒ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 7  
are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. \_\_\_\_\_ are so inadequately supported  
by the description that no meaningful opinion could be formed.

☒ no international search report has been established for said claims Nos. 11, 12

☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:

the written form

☐ has not been furnished

☐ does not comply with the standard

the computer readable form

☐ has not been furnished

☐ does not comply with the standard

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.

☒ See Supplemental Box for further details.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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| Box No. V                                 | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |            |     |
|---|---|------------|-----|
| 1. Statement                              |   |            |     |
| Novelty (N)                               | Claims  | 3, 5, 8-10 | YES |
|   | Claims  | 1, 2, 4, 6 | NO  |
| Inventive step (IS)                       | Claims  | 10         | YES |
|   | Claims  | 1-6, 8, 9  | NO  |
| Industrial applicability (IA)             | Claims  | 1-6, 8-10  | YES |
|   | Claims  |            | NO  |
| 2. Citations and explanations (Rule 70.7) |   |            |     |
| See Supplemental Box.                     |   |            |     |

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

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Box No. VIII      Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

See Supplemental Box.

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

**1. The present international preliminary report on patentability mentions the following documents:**

D1: US-A-4 547 745;  
D2: US 2002/0097087;  
D3: US-A-5 410 281;  
D4: US-6 252 871 B1.

**2. Box III**

The subject matter of claims 7, 11 and 12 has not been included in the substantive examination for the following reasons:

2.1 In the subject matter of claim 7, the desired technical meaning of the expression "connected on a single node to the same number of previous-level line segments" is extremely unclear.

2.2 The subject matter of claims 11 and 12 is the same as the subject matter of claims 12 and 13 in the published version. Since the subject matter of these two claims has not been searched (see the international search report), said claims have not been included in the international examination.

**3. Box VIII**

The examiner considers that the present application does not fulfil the requirements set

## Supplemental Box

forth in PCT Article 6 because the subject matter of claim 8 is not clear.

- 3.1 In the subject matter of claim 8, the connection between the first-level line segments and the second-level line segments is not clear. In this regard, it should be noted that claim 8 also covers the situation where the two second-level line segments are fully parallel connected. However, no such interpretation is supported by the description and the drawings.

**4. Box V**

The examiner considers that the application does not fulfil the requirements set forth in PCT Article 33(2) and 33(3) because the subject matter of claims 1-6, 8 and 9 is not novel or does not involve an inventive step.

- 4.1a The subject matter of claim 1 is not novel over document D2.

Document D2 discloses (the references between parentheses apply to said document):

an amplifier for microwave signals (figures 2-4 and 9) having a wavelength  $\lambda$ , which amplifier comprises a predetermined number N of active elements (22) parallel connected to a load impedance (S) via a matching device (5, 24;

## Supplemental Box

112-114) including:

- a predetermined number N of referenced susceptance compensation circuits respectively connected to the outputs of N active elements (24; paragraph 0032) to compensate for the output susceptances of said active elements; and
- a conductance-combining and -matching circuit (51, 52) having N inputs respectively connected to the outputs of said N susceptance compensation circuits, and one output connected to said load impedance (S) of said amplifier.

wherein said circuit (51, 52) for combining and matching the load conductances of said active elements:

- includes a predetermined number of line segments organised over M levels ( $M=2$ ), in which
- level 1 is respectively connected to the outputs of said N susceptance compensation circuits via N line segments (112) having an equal electrical length that is an integer multiple of  $\lambda/4$  (paragraph 0067, last line), and level M is connected to said load (S) of said amplifier,
- each level other than level 1 comprises a predetermined number of line segments (113, 114) having an equal electrical length that is an integer multiple of  $\lambda/2$  (paragraph 0067, line 6), each line



## Supplemental Box

segment of a level other than level 1 is connected to one or more line segments of the previous level, and the number of line segments of each level decreases as the number of levels from level 1 increases (figure 9: the level includes at least four line segments while level 2 includes two line segments).

Since document D2 discloses all of the features in claim 1, the subject matter of said claim is not novel under the terms of PCT Article 33(2).

As far as the expression "susceptance compensation circuits ... to compensate for the output susceptances of said active elements" is concerned, it should first of all be noted that the claim contains no information about the quality (or degree) of such desired compensation and this means that the verb "to compensate for" can be construed as meaning "to reduce". This interpretation has thus been used throughout the rest of the examination.

Even though the main purpose of impedances 24 is to ensure that the control circuit is properly decoupled from each amplifier output signal, it should be noted that such an impedance always affects the output impedance of amplifiers and thus enables (slight or significant) compensation for/reduction of susceptances. As a result, the subject matter of claim 1 is not novel over

## Supplemental Box

document D2.

- 4.1b It should also be noted that the subject matter of claim 2 does not involve an inventive step in light of documents D1 and D3.

Document D1 discloses (the references between parentheses apply to said document):

an amplifier for microwave signals (figures 1 and 3; column 3, line 15 to column 9, line 10) having a wavelength  $\lambda$ , which amplifier comprises a predetermined number N ( $N = 4$ ) of active elements (18, 19, 20, 21) parallel connected to a load impedance (59) via a matching device (26-29, 10) including:

- a predetermined number N ( $N = 4$ ) of referenced susceptance compensation circuits (26, 27, 28, 29) respectively connected to the outputs of N active elements (18, 19, 20, 21) to compensate for the output susceptances of said active elements (column 3, lines 25-29); and
- a conductance-combining and -matching circuit (10) having N inputs ( $N = 4$ ) respectively connected to the outputs of said N susceptance compensation circuits, and one output connected to said load impedance (59) of said amplifier.

Document D1 also discloses (column 3, line 68 to

## Supplemental Box

column 4, line 33; column 7, lines 36-46) that the impedance at node 57 corresponds to the output impedances of all of the parallel-connected line segments, with the result that the output impedance at node 57 decreases as the number of line segments increases. It follows that, depending on each particular case, the value of the output impedance at node 57 can be quite different to the intended impedance value and this means that additional impedance conversion may be necessary.

Document D3, which discloses a solution to this known problem, proposes (figure 1; column 7, lines 8-24) the use of two series-connected  $\lambda/4$  lines (14, 16) between the input/output (10) and the common node (18) to provide the desired impedance conversion.

It follows that the subject matter of claim 1 does not involve an inventive step in view of documents D1 and D3.

4.2 Document D2 also discloses (see figures 4 and 9) that:

- M-level line segments (113, 114) are connected to said amplifier load (S) via at least one line segment (71, 72) having an electrical length that is an integer multiple of  $\lambda/4$  (paragraph 0054), thus forming a level m+1.

## Supplemental Box

As a result, the subject matter of claim 2 is not novel.

- 4.3 Document D2 also discloses (see figure 9) that:
- the line segments having an electrical length that is an integer multiple of  $\lambda/2$  (113, 114) consist of a plurality of lines having an electrical length of  $\lambda/4$ .

It follows that the subject matter of claim 3 differs from the circuit known from document D2 only in that the lines having an electrical length of  $\lambda/4$  must also have different characteristic impedances.

In this regard, it should be noted that document D2 contains no information about the characteristic impedances of the two lines (113, 114) disclosed therein.

It is, therefore, the task of a person skilled in the art to select the most appropriate impedance values while bearing in mind individual technical needs (for example, the need for additional impedance conversion). It follows that considering different characteristic impedances is merely one of two options that a person skilled in the art seeking to solve the stated problem might select, depending on each particular case, and without an inventive step being involved.

## Supplemental Box

4.4 Document D2 also discloses (see figures 2 and 3) that:

- when the impedance input into the combination circuit by an inoperative active element associated with its susceptance compensation circuit is a short circuit, the electrical lengths of the first-level line segments are odd integer multiples of  $\lambda/4$  (paragraphs 0038-0040) so that an open circuit is presented on the level 1 nodes.

As a result, the subject matter of claim 4 is not novel.

4.5 The subject matter of claim 5 does not involve an inventive step in light of document D4, which discloses (figure 2) a combining and matching circuit (18, 22) organised over two levels. The first level (18) includes line segments (16A-16N) of which the electrical length is an even integer multiple of  $\lambda/4$ . The second level includes line segments (24A-28M) of which the electrical length is an integer multiple of  $\lambda/2$ . According to document D4 (column 3, lines 26-28), the number (N) of first-level line segments can be different from the number (M) of second-level line segments. This also includes the situation where the number (M) of second-level line segments is less than the number (N) of first-level line segments. Document D4 also discloses the use of switches (14) that generate open circuits at the inputs, and thus at

## Supplemental Box

the outputs, of first-level line segments when the RF signal source associated therewith is inoperative (column 3, lines 15-18 and lines 31-32).

As a result, the subject matter of claim 5 differs from the circuit known from document D4 in that the combining and matching circuit is part of:

- an amplifier for microwave signals having a wavelength  $\lambda$ , which amplifier comprises a predetermined number N of active elements parallel connected to a load impedance, and
- it includes a predetermined number N of referenced susceptance compensation circuits respectively connected to the outputs of N active elements to compensate for the output susceptances of said active elements.

In this regard, it should be noted that document D4 discloses (column 1, lines 4-11) that the combining and matching circuit is used to combine high-power microwave signals. Even though the expressions "amplifiers" and "active elements" are not mentioned anywhere in document D4, it would be obvious to a person skilled in the art of microwave frequency couplers that:

- this type of combining and matching circuit is used to combine individual input signals so that a single, more powerful output signal is produced (column 1, lines 8-11). This use is frequently considered in the field of power

## Supplemental Box

amplifiers;

- every real signal source (11A-11N) includes at least one active element; and
- said sources/active elements must at least be pre-matched so that their signals are in phase (column 1, lines 8-12) and this means that appropriate compensation circuits are required.

In view of the above, the subject matter of claim 5 does not involve an inventive step.

4.6 Document D2 also discloses (see figure 9) that:

- the sum of the electrical lengths (112, 113, 114) connecting a combination circuit input to its output (S) is an odd integer multiple of  $\lambda/4$  so as to produce an impedance inverting converter.

It follows that the subject matter of claim 6 is not novel.

4.7 Document D2 also discloses (see figure 9) that:

- the circuit for combining and matching the load conductances of the active elements is organised over two levels so as to match the amplifier load to four active elements only (the four amplifiers 22 illustrated in figure 9);
- the first level consists of four line segments (four lines 112) having an electrical length of  $\lambda/4$  (paragraph 0067);
- the second level consists of two line segments

## Supplemental Box

(113, 114) that have an electrical length of  $\lambda/2$  (paragraph 0067) and are connected via one of their common ends to the load impedance (S) of said amplifier; and

- said two line segments having an electrical length of  $\lambda/2$  are divided into two line segments having an electrical length of  $\lambda/4$ .

It follows that the subject matter of claim 8 differs from the circuit in document D2 only in that the second-level lines having an electrical length of  $\lambda/4$  must have different characteristic impedances. This feature does not, however, involve an inventive step for the reasons set out above (point 4.3).

4.8 Document D2 also discloses (figure 9) that:

- the circuit for combining and matching the load conductances of the active elements is organised over two levels so as to match the amplifier load (figure 9);
- the first level consists of line segments (four lines 112) having an electrical length of  $\lambda/4$  (paragraph 0067);
- the second level consists of two line segments (113, 114) that have an electrical length of  $\lambda/2$  (paragraph 0067) and are connected via one of their common ends to the load impedance (S) of said amplifier; and
- said two line segments with an electrical length



## Supplemental Box

of  $\lambda/2$  are divided into two line segments having an electrical length of  $\lambda/4$ .

It follows that the subject matter of claim 9 differs from the circuit known from document D2 in that:

- the amplifier includes "only six active elements";
- the first level includes "six line segments";
- the outputs of the susceptance compensation circuits (forming part of 22) are respectively connected "three by three" via a first-level line segment to one end of a second-level line segment, said end being opposed to the one connected to the load impedance; and
- the second-level lines with an electrical length of  $\lambda/4$  must have different characteristic impedances.

As far as the first three features are concerned, it should be noted that document D2 discloses the use of N channels, each of which includes an amplifier 22 and a  $\lambda/4$  line segment 112 (paragraph 0067). The first three features thus correspond to a configuration in which N is 3 and such an option is suggested in document D2.

As far as the last feature is concerned (the impedances of the second-level line segments), it should be noted that, alone, said feature does not involve an inventive step for the reasons set out

## Supplemental Box

above.

When considering all of the aforementioned features, it should be noted that the selection of the impedances of the second-level line segments is unrelated to the number and the structure of the active elements with their associated line segments. It follows that there is no technical synergy between the first three features and the last feature above that could give rise to an inventive step. As a result, the subject matter of claim 9 does not involve an inventive step.